INVESTIGATIONS INTO METAL PERMEABILITY AND SUPERPERMEABILITY ON 'PROMETEY' UNIT

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In RFNC - VNIIEF there was put in operation a 'Prometey' unit that enables to perform investigation into metal permeability and superpermeability to hydrogen isotopes.

Results of experiments on the study of hydrogen isotope superpermeability phenomenon through niobium membrane are presented. The sizes of a cylindrical membrane were ∅100x180mm, hydrogen isotope pressure varied in the range from 10^{-6} to 10^{-4}mbar. Gas was transformed into atomic state by means of atomizer based on tantalum heaters with operating temperature up to 2300 K.

The velocity of the membrane pumping out for hydrogen isotopes including tritium was about 1÷2 l/(cm^2·s). Experimental evaluations of the membrane compression and its nonsymmetry were obtained; niobium permeability coefficients to hydrogen isotopes in molecular and atomic states were calculated. The obtained experimental data are in good agreement with those in literature.

Research in permeability was performed on a model material — NPOE-nickel in the temperature range of 200-700^{0}C. The test specimen was in the form of a flat round membrane 0,2 mm in thickness and have diameter 30 mm. The obtained diffusion coefficients for hydrogen isotopes were in line with literature ones.

The tests having been performed prove the new unit efficiency. At present, extensive programmer studies on V-group metal and various structure materials superpermeability to hydrogen isotopes prepared. One aim of the investigations is a search for protective coatings effectively reducing the hydrogen isotope penetration including tritium into structure materials.

The work was performed under the ISTC-1110 project.